Anticoagulant Exposure in San Joaquin Kit Foxes

Stella McMillin
California Department of Fish and Game
Pesticide Investigations Unit

Background

- Department of Fish and Game Pesticide Investigations Unit is responsible for monitoring pesticide impacts on fish and wildlife in California.
- Receive animal carcasses from suspected pesticide poisonings all over the State.

Background

- Symptoms of anticoagulant toxicosis include unexplained bleeding in the body cavities and subcutaneously and lack of clotting in blood.
- Analysis of liver tissue of animals exhibiting anticoagulant toxicosis revealed high percent had been exposed to anticoagulants, with brodifacoum being the most frequent (58%), followed by bromadiolone, diphacinone, and chlorphacinone (Hosea 2000).
- Mostly result of secondary exposure.

Species Impacted

- Golden Eagles
- Great-horned Owls
- Barn Owls
- Red-tailed Hawks
- Cooper’s Hawks
- Coyotes
- SJ Kit Foxes
- Bobcats
- Kangaroo Rats
- Mountain Lions

B4

Rat poison
to deaths

By Zeke Barlow

ENVIRONMENT

Toxic prey

Poison targeting the rodent population is turning up in their predators.

By Stephanie O'Neill

Pesticide Investigations Unit Necropsy Anticoagulant Poisoning

Coyotes

Owls

All anticoagulants are not created equal.

1st Generation anticoagulants

- Multiple feedings
- Less persistent in tissues
- Commensal and outdoor use
- Chlorphacinone, diphacinone, warfarin

2nd generation anticoagulants

- Intended for single feeding (more toxic)
- More persistent in tissue
- Registered only for commensal use
- Brodifacoum, bromadiolone, difethialone

Anti-Coagulants Residues in Wildlife (1992-2000)

- Difethialone (1%)
- Chlorophacinone (7%)
- Diphacinone (8%)
- Bromadiolone (19%)
- Brodifacoum (66%)

Persistence of anticoagulants in liver tissue (USEPA)

Brodifacoum: 217 days

Bromadiolone: 248 days

Difethialone: 118 days

Diphacinone: 90 days

Warfarin: 35 days

Acute Oral Toxicity of Anticoagulants to Dogs (LD50 values in mg ai/kg)

Brodifacoum: 0.25 -1

Bromadiolone: 8.1

Difethialone: 4

Chlorphacinone: 50 – 100

Diphacinone: 3 – 15

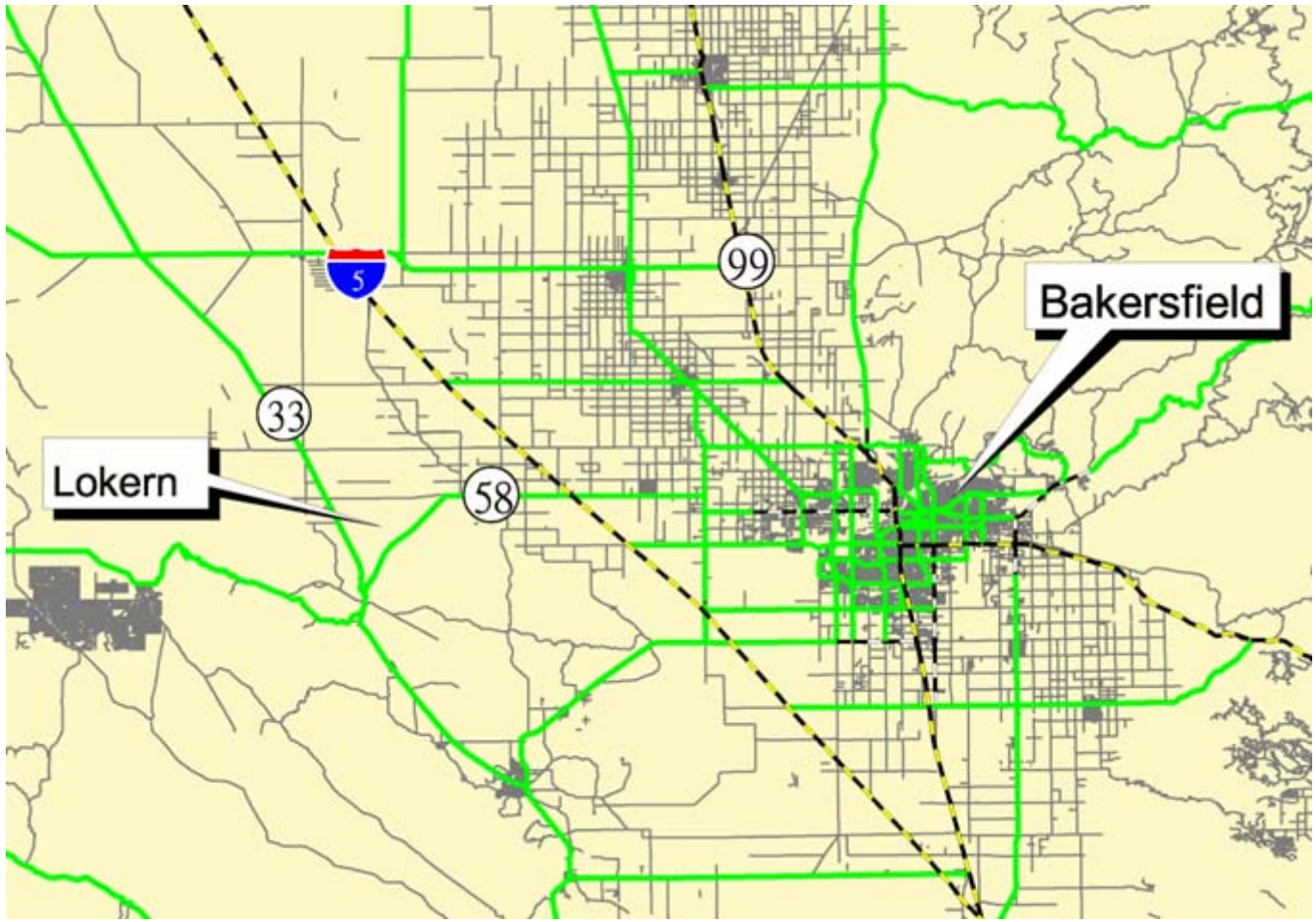
Warfarin: 20 - 50

San Joaquin Kit Foxes in Bakersfield

- San Joaquin Kit Fox (*Vulpes macrotis*) – permanent reproducing population in Bakersfield.
- Diet: rodents and rabbits.
- Federally endangered and State threatened.

Wildland-Urban Interface

The Study Area



Methods

- CSU Stanislaus (Brian Cypher) collected carcasses (radiocollared foxes) and extracted liver tissue.
- Liver tissue homogenized at DFG.
- DFG Water Pollution Control Laboratory (Chemist Abdou Mekebri) analyzed samples using Gel Permeation Chromatography and LCMS.
- 30 Bakersfield foxes, 12 from control site.

Extraction of liver tissue: CSU Stanislaus

Results of San Joaquin Kit Fox monitoring

- 87% of foxes from Bakersfield contained brodifacoum residues – compared with none of the foxes from the control site.
- 43% of foxes from Bakersfield contained bromadiolone residues – compared with none of the foxes from the control site.
- One Bakersfield fox contained chlorphacinone residue.

Conclusions

- Residue data confirm urban contribution to anticoagulant exposure problem
- Brodifacoum and bromadiolone are registered only for commensal use
- Lethal/Sublethal effects (reproductive, disease susceptibility)

Further studies needed

- Continued analysis of SJKF livers
- Homeowner Use Surveys for Rodenticides
- Physical Surveys Within Home Ranges for Possible Sources of Rodenticide Exposure
- Reproductive Success of Urban Population vs. Other Populations

Regulatory Actions

- USEPA
- DPR